AMSAT SATELLITE REPORT

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UoSAT Is Back!

In a sparkling example of teamwork and professionalism, the *ad hoc* UoSAT Salvage Team at SRI International has accomplished a dramatic success in their efforts to restore UO-9 to useful life. Working with the 150-foot SRI International dish in Northern California, the SRI team finally commanded the UO-9 Beacons off at 2235 UTC, Monday, 20 September. The success capped a multi-month effort by the SRI Team, K1WHS at Lebanon, Maine and at the UoSAT Program Office at the University of Surrey, England to rectify the tragic error which had rendered UO-9 all but useless.

But in the end, it was the ERP at SRI which prevailed at 70-cm command frequency. Under the leadership of Dr. Robert Leonard, KD6DG, Director of the Radio Physics Laboratory at SRI, the Team overcame numerous setbacks including broken azimuth drive motors, missing tracking computers and various hydraulic problems to accomplish their mission. Thus it was tenacity and singleness of purpose which not only galvanized the Team to action but insured their perserverance in the face of protracted adversity. Equally determined to salvage thier hard-earned payoff, the team at Surrey under Dr. Martin Sweeting, G3YJO, provided many of the tools for the SRI effort including the command encoder. G3YJO's calculations showed that the SRI system was sufficiently powerful and should work. But why hadn't it?

In April, UO-9 had accidently been commanded to turn on both beacons, one at 2 meters and one at 70 cm. This command error effectively desensed both the 2 meter and 70 cm command receivers rendering UO-9 insensitive to further ground station command. Thus began the search for stations with sufficient ERP to overcome UO-9 desense. K1WHS tried on 2 meters with his 26 dBd EME array without success. Now SRI finally has managed to blast through the self-QRMing of UoSATs transponders, command the beacons off and allow normal ground-originated commanding to resume. The dish at SRI exhibits about 42 dBd gain at 70 cm. Previous estimates (*ASR* #38) indicated at least 12 megawatts ERP could be targeted on UO-9.

The climactic episode actually began with events on Saturday, 18 September, when a glitch in the command encoder at SRI was exorcised. But UO-9 was not in a favorable position on Saturday. Sunday, it was in a good position but uncertainty in its exact location with respect to time during the pass (caused by "aged" predicts) caused intolerable tracking errors. (The 3-dB beamwidth is about 0.6 degrees at 70 cm.) Monday brought new predicts and on Monday afternoon, at 1535 Pacific Daylight time, upon commanding on 70 cm, suddenly the 2-meter receiver monitoring UO-9 on 145.825 MHz went silent. *Voila!*

The SRI team called G3YJO at midnight, Surrey local time. What followed can only be described as unrestrained jubilation that apparently the months of frustration, anxiety, embarrassment and grief had ended. By morning on the 21st it was clear. UO-9 was "nominal." The bird had weathered the storm with hardly a "feather" out of place.

By morning on the East Coast of the U.S. word had been received at AMSAT HQ and at *ASR* via KD6DG that UO-9 was back and in good health. The reaction of the Amateur community was universal and immediate: joy, cheers, jubilation ... and relief that at last the tribulation of UoSAT was successfully concluded. ARRL promptly dispatched a W1AW bulletin to spread the wonderful news. UoSAT is back! Scientists and engineers at Goddard Space Flight Center greeted the news with buoyant celebration. Several, including Dr. Mario Acuna, LU9HBG/W3 had participated in UoSAT design and construction.

Now, one of the epochal dramas in Amateur Radio annals closes on a distinctly positive note. Amateurs of all callings may be especially proud for the actions of the SRI team in support of Surrey. Together they have added a profound and seminal page to the Amateur legacy. Amateurs have previously proven adept at self-policing regulatory matters. Now Amateurs have proven equally adept at self-correcting enormously challenging technical anomalies.

A proud day indeed!

Editors Note: *ASR* will carry a detailed account in its next issue.

The View From Here
An Editorial Opinion

ASR has focused on news of the Amateur Satellite world with infrequent diversion. Occasions do arise, however which virtually require the additional perspective often afforded in editorial comment.

This is such an occasion.

A recent edition of a well-respected newsletter, *Westlink Report* (WLR) reports on the Cablesat General-proposed ARNET geosynchronous Amateur satellite system now before the FCC (See *ASR* #40). While AMSAT and *ASR* warmly embrace the prospect of ARNET, we feel obliged to point out the risks to be faced along the way. Unfortunately, the prospects for Cablesat's proposal are not particularly bright. There is a great competition for authority to build and operate domsats in this highly profitable business. The addition of a "public service" aspect (ARNET) to the primarily commercial package may not afford the advantage Cablesat hopes it will. The result may be an unfortunate let down for enthusiasts anxious for the new resource (ARNET).

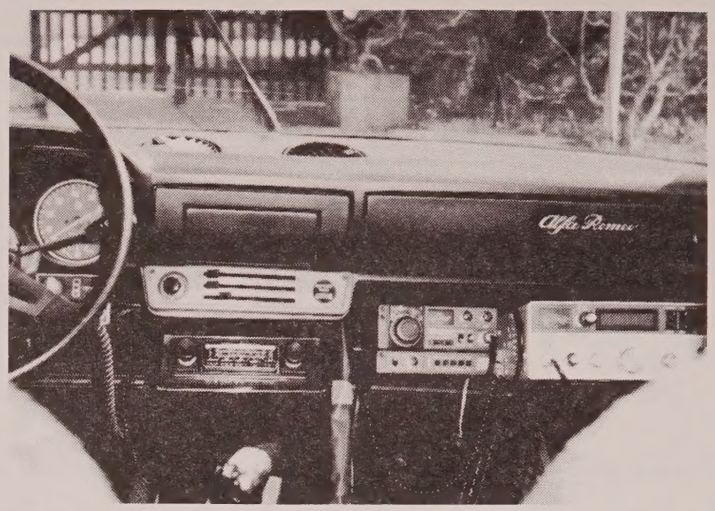
However, responding to the first drum beat, the parade of would-be ARNET users and managers is already queuing up. Typical of the parade leaders is the ATV crowd led by Mike Stone, WB0QCD, editor of *A5 Magazine*. *ASR*, by raising a small "caution flag" hopes to persuade *A5* and *WLR* (among others) that the time for cautious optimism is at hand. The time for unrestrained drum beating is yet to come.

The immoderate reporting of ARNET serves no one well in *ASR's* view. While *ASR* encourages enthusiasm where it helps motivate to build and support, we regret the beginnings of a parade marching to an uncertain drum beat. To promote without regard to risk is to lay snares of potential disappointment on the parade route. Extravagant, unrealistic and impassioned claims serve no aim in common with responsible reporting. — *WA2LQQ*

Radio Sport Federation Sponsors Events

According to Pat Gowen, G3IOR, AMSAT European Regional Coordinator, the Radio Sport Federation of the USSR will sponsor a series of Activity Weekends throughout the month of October. The events are designed to commemorate the 3 October '57 launch of Sputnik and the 28 October '78 launch of RS-1 and RS-2.

Although details are sketchy at present, this much seems clear from G3IOR. The Activity Weekends will be held each of the five weekends beginning at 0000 UTC Saturday and continuing through 2400 UTC each Sunday. Points are scored as follows. Five points for the first QSO with a given station and one point for each subsequent QSO with that station. Only one QSO per individual callsign worked per orbit. Additional details are expected to be transmitted from the bulletin board features of RS-5 and RS-7. This info will likely include instructions on entry filing deadlines and mailing addresses, etc.



This is the operating set-up of HB9XJ/M, who not only regularly joins in the the AMSAT European Net on 14.280 MHz at 1000 each Saturday, but also works many stations via the satellites.

Report: Packet Success On OSCAR

ASR has learned that the initial packet radio experiments being conducted by Bob Diersing, N5AHD, and Tom Clark, W3IWI, have met with initial, if limited, success. It is reported in a release from N5AHD of Corpus Christi, Texas, that on 1 Sept. 82 at 01:10 UTC, Bob successfully sent and received packets at his station via AMSAT-OSCAR 8, Mode J. Bob reports that in some cases the three line QST was received complete while in others it was incomplete. The initial success was obtained using nbfm modulation. On 6 Sept. he tried again on Mode J but this time he was using ssb. The results using ssb were much poorer according to Bob, "mainly due to the better tuning indicator via the discriminator meter."

Both stations are using Terminal Node Controller (TNC) boards produced by the Vancouver Amateur Digital Communications Group (VADCG). The software was developed and modified by AMRAD and Doug Lockhart, VE7APU. The successful try used 1200 baud. These tests will likely continue on an intermittant basis so if you hear one of the tests under way, you'll be aware of what's going on in the middle of the Mode-J passband.

Meeting Reminders

President Tom Clark, W3IWI, reminds everyone that the annual meeting is coming up on 10 October. Everyone should have their election ballots in the mail today to insure receipt before the cutoff. Tom adds that the swap fest mentioned in *ASR* #41 will run from 9 until noon, not 9 until 10 as announced. Also, please note that the minimum donation for lunch is $6, not $5 as mentioned earlier in *ASR* #41.

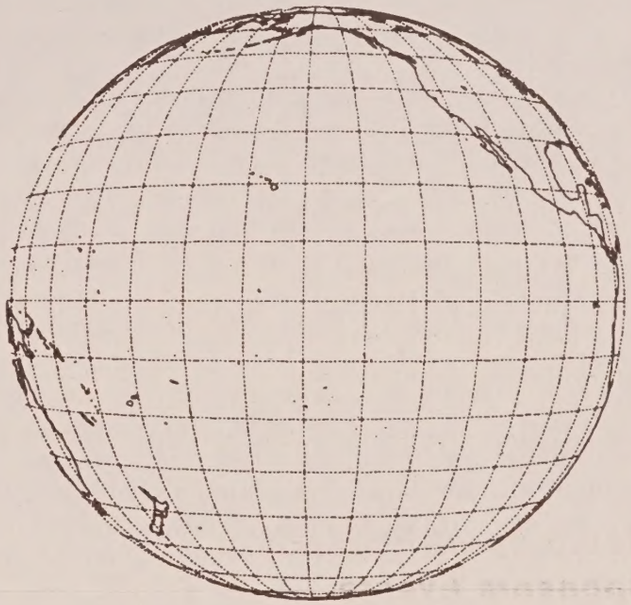
Martha indicates that as of mid-September over 1,000 ballots had been received at AMSAT HQ. A first rate turnout. This year's meeting and the Saturday seminar which precedes it both are lining up to be the best in years. *ASR* hopes to see many of the AMSAT team on hand for these special events. Make it a point to be there. *ASR* will be there with cameras and notepads. Want to have your picture grace these pages? Be there and you may luck out!

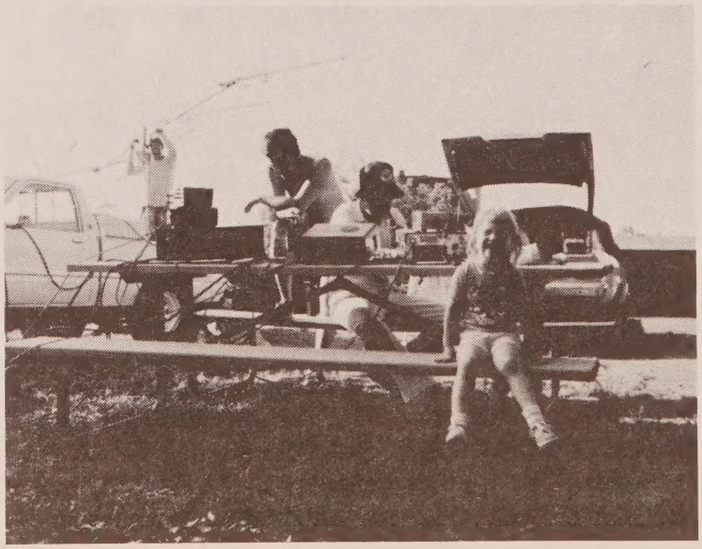
Computer Maps Out Future Satellite Tracks

Working with a powerful computer, Phil Karns, KA9Q, has produced some intriguing computer maps. Shown are some examples of his work. The best is yet to come, however. Phil is working on a "movie" of what the earth will look like from Phase IIIB through over two orbits. The movie is actually a computer map plot of the earth as it would appear from a point along the Phase IIIB orbital path. It is particularly significant to watch the areas visible since any two areas visible are automatically within communications range of each other via Phase IIIB. The effect is said to be awe-inspiring. Phil hopes to preview the movie in October at the Hudson Division ARRL Convention. If progress allows, however, selected portions of the movie may be shown at the AMSAT Annual meeting. The movie is short but involves hundreds of hours of computation to develop the color graphics display that results. Don't miss this one!

Earth as seen from the proposed position of the ARNET satellites (see *ASR* #40) of 60° West and 150° West.

A Mercator projection showing the SSP track of Phase IIIB while in its transfer ellipse. The small X is the point of orbital insertion after launch at mid-Atlantic. The track follows a west-to-east course most of the time except for the shorter east-to-west loopback seen over northern South America here. These loopbacks occur because the satellite is at apogee and the earth's rotation "under" the satellite is then faster than the satellite's motion around the ellipse.





The Rich Mountain, Arkansas DXpedition on May 30-31, 1982. Pictured are (l-r) WB5ROR, Rodney, KO5I and Jennifer. Photo by WB5TNC.

Phase IIIB Tests Enter Final Stage

AMSAT's Phase IIIB satellite is now undergoing the final series of tests to prepare it for launch. The spacecraft is presently in West Germany at the University of Marburg "Satelliten Werks" of AMSAT DL President, Dr. Karl Meinzer, DJ4ZC. AMSAT's Vice President for Engineering, Jan King, W3GEY, travelled from Washington to Marburg 13 Sept. 82 to participate in the tests.

The series of tests will include the shake and vibration tests, transponder performance tests, tests of the Integrated Housekeeping Unit (IHU or computer) and various other functional tests to assure that the entire spacecraft performs as specified. The malfunctions in the transponders that were revealed during the thermal vacuum tests performed in June (See *ASR* #35) at the Goddard Space Flight Center have been corrected. Minor redesign was performed to eliminate some instabilities that showed up at elevated temperatures.

Results of the present tests may provide the best estimates yet of ground station requirements in terms of uplink power and receive sensitivity. These specification refinements will result from definitive characterization of the spacecraft rf system in terms of effective radiated power, antenna patterns, rf power generated and receive sensitivity.

Following successful completion of the present battery of tests, Phase IIIB may be placed in storage or it may be "burnt in" at the lab. Often it is desireable to age an electronic device to increase long-term reliability. This is commonly called a "burn in period." Paradoxically, to maximize the long term reliability of the device, it is often desireable to "put some miles on the odometer." While this would seem at first blush to make it more likely that a failure would occur in the predicted life of the device, it actually decreases the expected long-term failure rate by nabbing a class of failures occurring early. Early failures are called "infant mortality" failures. In reliability analysis, failure rates often resemble a saddle curve where most failures occur very early and very late in the design life of the device. By burning in the device, the strategy is to accumulate "use hours" and get to the lower regions of the saddle curve before launch. Reliability engineers tell us that this method will reduce the likelihood of failure of the spacecraft during its orbital life. A suitable comparison is the apparent high number of visits to the dealer you must make for corrective maintenance (as opposed to preventive maintenance) just after purchasing a new car. Little things such as a not-so-tight muffler clamp that rattles or an instrument lamp that fails to illuminate. That's infant mortality in cars. Fortunately, with your Datsun, Citroen, Ford or BMW, the dealer is nearby. Not so for Phase IIIB, *naturlick!* Much later on in the life of the car the frequency of breakdowns rises again (the saddle effect on the other side of the curve).

All of the subsystems of Phase IIIB have accumulated aging time as they were tested at the module (e.g. transponder or IHU) level. An interesting engineering question now arises regarding the efficacy of aging at the spacecraft level. That is, does it make sense to age the spacecraft in the lab in its fully integrated state? We must rely on our engineering team to make this judgement, of course. Meanwhile, the potential user community can rest assured that the most advanced analytical tools available are being applied to the Phase IIIB spacecraft during these pivotal tests at Marburg.

Since the launch of Phase IIIB may now occur in spring of '83, there is some time to work with, to further optimize the systems and in turn our confidence that once in orbit this penultimate Amateur satellite will perform as expected.

Computer Project Sets Sail

An initial meeting of the ZX-81 computer development team was held on the 20-meter band on 4 September. Led by Team Leader KO5I, others on the team are W3IWI, WAØYGJ, KEØT, W6KAG, KØRZ, WA2LQQ, WØPN and WØRPK. The objective of this team is to develop simple, inexpensive systems for tracking satellites, pointing antennas, keeping time and operations scheduling. The base hardware selected is the Sinclair ZX-81 (aka Timex/Sinclair 1000). Two versions are now seen. A so-called "plain vanilla" based on a ZX-81/1000 with 16K RAM and a more advanced version with enhanced capabilities. The plan is to have the "vanilla" version in place before the launch of Phase IIIB and to build on this product base as the more advanced dynamic version comes on-stream.

Cost is an important driver on this project as the main objective is to provide an affordable computer for tracking Phase IIIB. More details on this fascinating project to come as they become available. Meanwhile, if you would like to help out in a worker capacity (as opposed to a consumer capacity) you are cordially invited to contact the Team Leader, Doug Loughmiller, KO5I, at his *Callbook* address.

Quebec Amateurs Hear VE2ASL

On August 13, 14 and 15 the provincial association of the Radio Amateur Society of Quebec held its 32nd annual convention in St. Hyacinthe near Montreal. A featured attraction of the convention was the appearance of AMSAT Provincial Coordinator Bob Sondack, VE2ASL. Bob's talk covered past and present satellites, use of locator systems and equipment required at the home of potential amateur satellite users.

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